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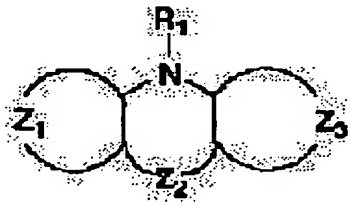
KITA HIROSHI

(54) ORGANIC ELECTROLUMINESCENT ELEMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an organic electroluminescent element and a new electroluminescent element materials emitting high brightness light.
SOLUTION: With an electroluminescent element which pinches light-emitting layer having a single-layer or multiple-layer organic compound film between opposing anode and cathode, at least one layer of the organic compound film contains at lest one kind of compounds indicated by the formula.

一般式(1)



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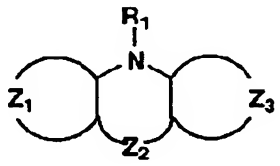
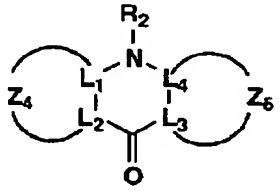
CLAIMS

[Claim(s)]
[Claim 1] The organic electroluminescent element characterized by the thing of the compound of this organic compound thin film further expressed with the following general formula (I) for which a kind is contained at least at least between the anode plates and cathode which counter mutually in the organic electroluminescent element which pinches the luminous layer which has a monolayer or the organic compound thin film of two or more layers.
[Formula 1]
一般式(I)

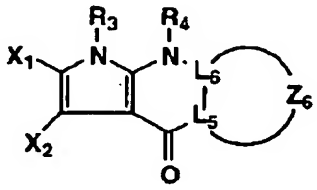


(Z1 expresses aromatic series heterocycle among a formula, Z2 expresses a connection radical or a mere joint hand, Z3 expresses an aromatic hydrocarbon ring or aromatic series heterocycle, and R1 expresses a hydrogen atom or a substituent.)
[Claim 2] The organic electroluminescent element characterized by the thing of the compound of this organic compound thin film further expressed with the following general formula (II) for which a kind is contained at least at least between the anode plates and cathode which counter mutually in the organic electroluminescent element which pinches the luminous layer which has a monolayer or the organic compound thin film of two or more layers.
[Formula 2]
一般式(II)

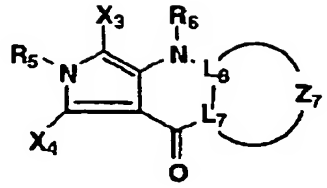


(Z4 expresses a nonmetal atom group required to form the aromatic series heterocycle of 5 or 6 membered-rings with L1 and L2 among a formula, and Z5 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L3 and L4.) L1, L2, L3, and L4 express a methine group respectively. R2 expresses a hydrogen atom or a substituent.
[Claim 3] The organic electroluminescent element characterized by the thing of the compound of this organic compound thin film further expressed with the following general formula (III), a general formula (IV), a general formula (V), a general formula (VI), or a general formula (VII) for which a kind is contained at least at least between the anode plates and cathode which counter mutually in the organic electroluminescent element which pinches the luminous layer which has a monolayer or the organic compound thin film of two or more layers.
[Formula 3]

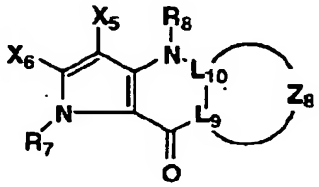
一般式(III)



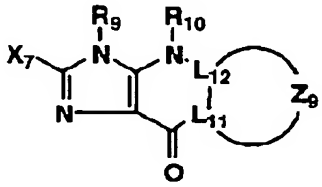
一般式(IV)



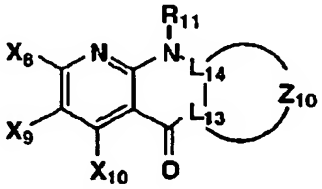
一般式(V)



一般式(VI)



一般式(VII)

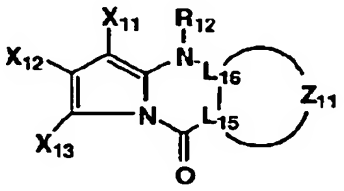


(X1, X2, R3, and R4 express a hydrogen atom or a substituent independently respectively among a general formula (III), it may join together mutually through direct or a substituent, and X1 and X2 may form the condensed ring.) Z6 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L5 and L6. L5 and L6 express a methine group respectively. X3, X4, R5, and R6 express a hydrogen atom or a substituent independently respectively among a general formula (IV), it may join together mutually through direct or a substituent, and X3 and X4 may form the condensed ring. Z7 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L7 and L8. L7 and L8 express a methine group respectively. X5, X6, R7, and R8 express a hydrogen atom or a substituent independently respectively among a general formula (V), it may join together mutually through direct or a substituent, and X5 and X6 may form the condensed ring. Z8 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L9 and L10. L9 and L10 express a methine group respectively. X7, R9, and R10 express a hydrogen atom or a substituent independently respectively among a general formula (VI), and Z9 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L11 and L12. L11 and L12 express a methine group respectively. X8, X9, X10, and R11 express a hydrogen atom or a substituent independently respectively among a general formula (VII), and it may join together mutually through direct or a substituent, and adjoining X8, and X9, X9 and X10 may form the condensed ring. Z10 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L13 and L14. L13 and L14 express a methine group respectively.

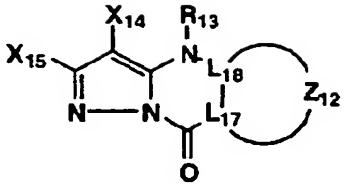
[Claim 4] The organic electroluminescent element characterized by the thing of the compound of this organic compound thin film further expressed with the following general formula (VIII), a general formula (IX), or a general formula (X) for which a kind is contained at least at least between the anode plates and cathode which counter mutually in the organic electroluminescent element which pinches the luminous layer which has a monolayer or the organic compound thin film of two or more layers.

[Formula 4]

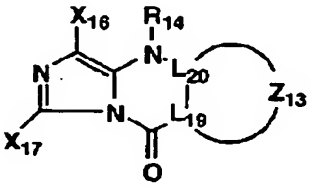
一般式(VIII)



一般式(IX)



一般式(X)

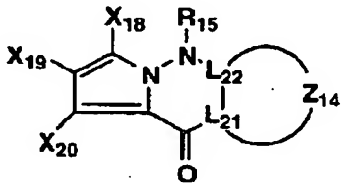


(X11, and X12, X13 and R12 express a hydrogen atom or a substituent independently respectively among a general formula (VIII), and it may join together mutually through direct or a substituent, and adjoining X11, and X12, X12 and X13 may form the condensed ring.) Z11 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L15 and L16. L15 and L16 express a methine group respectively. X14, X15, and R13 express a hydrogen atom or a substituent independently respectively among a general formula (IX), it may join together mutually through direct or a substituent, and X14 and X15 may form the condensed ring. Z12 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L17 and L18. L17 and L18 express a methine group respectively. X16, X17, and R14 express a hydrogen atom or a substituent independently respectively among a general formula (X), and Z13 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L19 and L20. L19 and L20 express a methine group respectively.

[Claim 5] The organic electroluminescent element characterized by the thing of the compound of this organic compound thin film further expressed with the following general formula (XI) for which a kind is contained at least at least between the anode plates and cathode which counter mutually in the organic electroluminescent element which pinches the luminous layer which has a monolayer or the organic compound thin film of two or more layers.

[Formula 5]

一般式(XI)

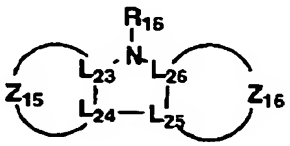


(X18, X19, X20, and R15 express a hydrogen atom or a substituent independently respectively among a formula, and Z14 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L21 and L22.) L21 and L22 express a methine group respectively.

[Claim 6] The organic electroluminescent element characterized by the thing of the compound of this organic compound thin film further expressed with the following general formula (XII) for which a kind is contained at least at least between the anode plates and cathode which counter mutually in the organic electroluminescent element which pinches the luminous layer which has a monolayer or the organic compound thin film of two or more layers.

[Formula 6]

一般式(XII)

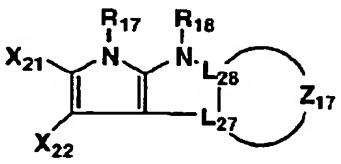


(Z15 expresses a nonmetal atom group required to form the aromatic series heterocycle of 5 or 6 membered-rings with L23 and L24 among a formula, and Z16 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L25 and L26.) L23, L24, L25, and L26 express a methine group respectively. R16 expresses a hydrogen atom or a substituent.

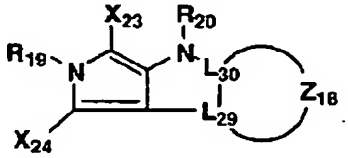
[Claim 7] The organic electroluminescent element characterized by the thing of the compound of this organic compound thin film further expressed with the following general formula (XIII), a general formula (XIV), a general formula (XV), a general formula (XVI), or a general formula (XVII) for which a kind is contained at least at least between the anode plates and cathode which counter mutually in the organic electroluminescent element which pinches the luminous layer which has a monolayer or the organic compound thin film of two or more layers.

[Formula 7]

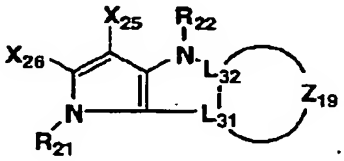
一般式(XIII)



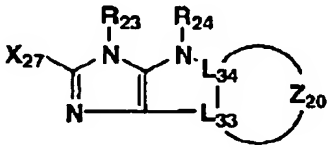
一般式(XIV)



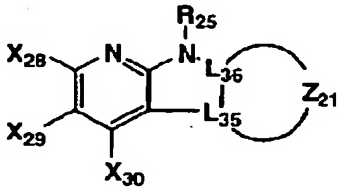
一般式(XV)



一般式(XVI)



一般式(XVII)



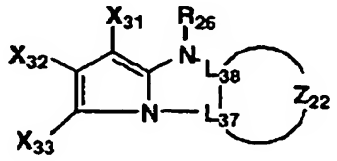
(X21, X22, R17, and R18 express a hydrogen atom or a substituent independently respectively among a general formula (XIII), and it may join together mutually through direct or a substituent, and adjoining X21 and X22 may form the condensed ring.) Z17 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L27 and L28. L27 and L28 express a methine group respectively. X23, X24, R19, and R20 express a hydrogen atom or a substituent independently respectively among a general formula (XIV), and Z18 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L29 and L30. L29 and L30 express a methine group respectively. X25, X26, R21, and R22 express a hydrogen atom or a substituent independently respectively among a general formula (XV), and it may join together mutually through direct or a substituent, and adjoining X25 and X26 may form the condensed ring. Z19 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L31 and L32. L31 and L32 express a methine group respectively. X27, R23, and R24 express a hydrogen atom or a substituent independently respectively among a

general formula (XVI), and Z20 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L33 and L34. L33 and L34 express a methine group respectively. X28, X29, X30, and R25 express a hydrogen atom or a substituent independently respectively among a general formula (XVII), and it may join together mutually through direct or a substituent, and adjoining X28, and X29, X29 and X30 may form the condensed ring. Z21 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L35 and L36. L35 and L36 express a methine group respectively.

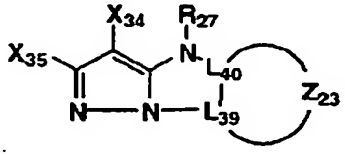
[Claim 8] The organic electroluminescent element characterized by the thing of the compound of this organic compound thin film further expressed with the following general formula (XVIII), a general formula (XIX), or a general formula (XX) for which a kind is contained at least at least between the anode plates and cathode which counter mutually in the organic electroluminescent element which pinches the luminous layer which has a monolayer or the organic compound thin film of two or more layers.

[Formula 8]

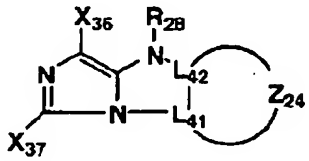
一般式(XVIII)



一般式(XIX)



一般式(XX)

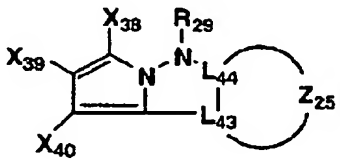


(X31, X32, X33, and R26 express a hydrogen atom or a substituent independently respectively among a general formula (XVIII), and it may join together mutually through direct or a substituent, and adjoining X31, and X32, X32 and X33 may form the condensed ring.) Z22 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L37 and L38. L37 and L38 express a methine group respectively. X34, X35, and R27 express a hydrogen atom or a substituent independently respectively among a general formula (XIX), and it may join together mutually through direct or a substituent, and adjoining X34 and X35 may form the condensed ring. Z23 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L39 and L40. L39 and L40 express a methine group respectively. X36, X37, and R28 express a hydrogen atom or a substituent independently respectively among a general formula (XX), and Z24 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L41 and L42. L41 and L42 express a methine group respectively.

[Claim 9] The organic electroluminescent element characterized by the thing of the compound of this organic compound thin film further expressed with the following general formula (XXI) for which a kind is contained at least at least between the anode plates and cathode which counter mutually in the organic electroluminescent element which pinches the luminous layer which has a monolayer or the organic compound thin film of two or more layers.

[Formula 9]

一般式(XXI)



(X38, X39, X40, and R29 express a hydrogen atom or a substituent independently respectively among a formula, and it may join together mutually through direct or a substituent, and adjoining X38, and X39, X39 and X40 may form the condensed ring.) Z25 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L43 and L44. L43 and L44 express a methine group respectively.

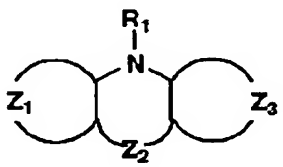
[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to an organic electroluminescent element ingredient and an organic electroluminescence (it is written also as organic electroluminescence below) component, and relates to an organic EL device ingredient and an organic EL device excellent in luminescence brightness in more detail.
[0002]
[Description of the Prior Art] Conventionally, although the inorganic electroluminescent element has been used as the flat-surface mold light source, in order to make this light emitting device drive, the high voltage of an alternating current is required for it. The organic electroluminescent element developed recently Have the configuration whose thin film containing a fluorescence organic compound was pinched in cathode and an anode plate, and an exciton (exciton) is made to generate by making an electron and an electron hole pour in and recombine with said thin film. It is the component which emits light using emission (fluorescence and phosphorescence) of the light at the time of this exciton deactivating. severalV- dozens — light can be emitted by about V low battery, since it is a self-luminescence mold, it is rich in an angle-of-visibility dependency, and visibility is high, and since it is the perfect solid-state component of a thin film mold, it is observed from viewpoints, such as space-saving and portability.
[0003] Until now, various organic EL devices are reported. For example, what combined the hole-injection layer and the organic emitter layer of a publication with Appl.Phys.Lett.51 volume, 913 pages, or JP,59-194393,A, the thing which combined the hole-injection layer and electron injection transportation layer of a publication with JP,63-295695,A, Jpn.Journal of Applied Phisycs, 127 volumes, and the thing that combined the electron hole moving bed, luminous layer, and electronic transition layer of a publication with No.2,269-271 page are indicated, respectively. however — more — high — the brightness component is called for and the further improvement in an energy conversion efficiency and luminescence quantum efficiency is expected. Moreover, the trouble that a luminescence life is short is pointed out. Although it passes and the factor of brightness degradation by the time is not solved completely, the factor originating in the organic compound which are organic EL device ingredients, such as disassembly of the organic compound itself which constitutes a thin film with such a light which emits the electroluminescent element under luminescence itself, the heat then generated, and crystallization of the organic compound in the inside of a thin film, is also pointed out.
[0004]
[Problem(s) to be Solved by the Invention] The purpose of this invention offers the new organic electroluminescent element ingredient and the organic electroluminescent element which emit light in high brightness.
[0005]
[Means for Solving the Problem] The above-mentioned purpose of this invention is attained by the following configuration.
[0006] 1. Organic electroluminescent element characterized by thing of compound of this organic compound thin film further expressed with following general formula (I) for which kind is contained at least at least between anode plates and cathode which counter mutually in organic electroluminescent element which pinches luminous layer which has monolayer or organic compound thin film of two or more layers.
[0007]
[Formula 10]
一般式(I)



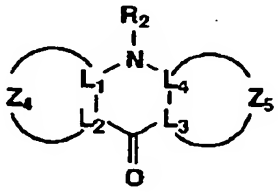
[0008] Z1 expresses aromatic series heterocycle among a formula, Z2 expresses a connection radical or a mere joint hand, Z3 expresses an aromatic hydrocarbon ring or aromatic series heterocycle, and R1 expresses a hydrogen atom or a substituent.
[0009] 2. Organic electroluminescent element characterized by thing of compound of this organic compound thin film

further expressed with following general formula (II) for which kind is contained at least at least between anode plates and cathode which counter mutually in organic electroluminescent element which pinches luminous layer which has monolayer or organic compound thin film of two or more layers.

[0010]

[Formula 11]

一般式(II)



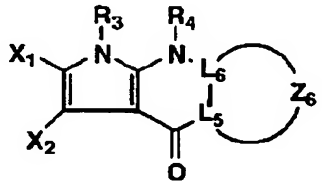
[0011] Z4 expresses a nonmetal atom group required to form the aromatic series heterocycle of 5 or 6 membered-rings with L1 and L2 among a formula, and Z5 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L3 and L4. L1, L2, L3, and L4 express a methine group respectively. R2 expresses a hydrogen atom or a substituent.

[0012] 3. Organic electroluminescent element characterized by thing of compound of this organic compound thin film further expressed with following general formula (III), general formula (IV), general formula (V), general formula (VI), or general formula (VII) for which kind is contained at least at least between anode plates and cathode which counter mutually in organic electroluminescent element which pinches luminous layer which has monolayer or organic compound thin film of two or more layers.

[0013]

[Formula 12]

一般式(III)



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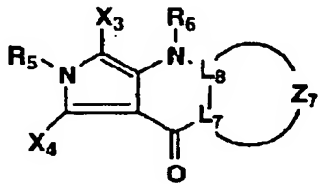
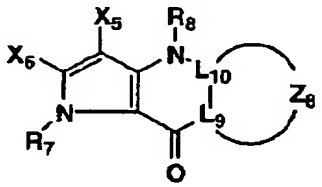
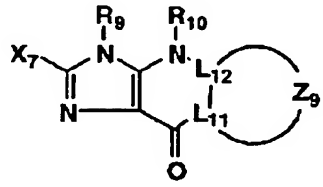


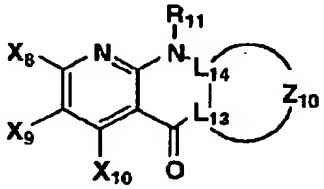
一般式(V)



一般式(VI)

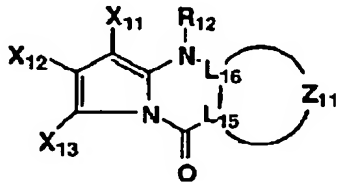


一般式(VII)

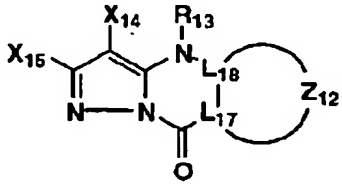


[0014] X1, X2, R3, and R4 express a hydrogen atom or a substituent independently respectively among a general formula (III), it may join together mutually through direct or a substituent, and X1 and X2 may form the condensed ring. Z6 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L5 and L6. L5 and L6 express a methine group respectively.

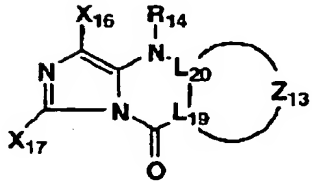
[0015] X3, X4, R5, and R6 express a hydrogen atom or a substituent independently respectively among a general formula (IV), it may join together mutually through direct or a substituent, and X3 and X4 may form the condensed ring. Z7 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L7 and L8. L7 and L8 express a methine group respectively.
[0016] X5, X6, R7, and R8 express a hydrogen atom or a substituent independently respectively among a general formula (V), it may join together mutually through direct or a substituent, and X5 and X6 may form the condensed ring. Z8 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L9 and L10. L9 and L10 express a methine group respectively.
[0017] X7, R9, and R10 express a hydrogen atom or a substituent independently respectively among a general formula (VI), and Z9 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L11 and L12. L11 and L12 express a methine group respectively.
[0018] X8, X9, X10, and R11 express a hydrogen atom or a substituent independently respectively among a general formula (VII), and it may join together mutually through direct or a substituent, and adjoining X8, and X9, X9 and X10 may form the condensed ring. Z10 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L13 and L14. L13 and L14 express a methine group respectively.
[0019] 4. Organic electroluminescent element characterized by thing of compound of this organic compound thin film further expressed with following general formula (VIII), general formula (IX), or general formula (X) for which kind is contained at least at least between anode plates and cathode which counter mutually in organic electroluminescent element which pinches luminous layer which has monolayer or organic compound thin film of two or more layers.
[0020]
[Formula 13]
一般式(VIII)



一般式(IX)

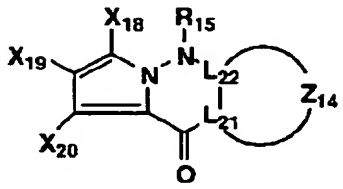


一般式(X)

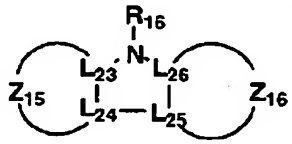


[0021] X11, and X12, X13 and R12 express a hydrogen atom or a substituent independently respectively among a general formula (VIII), and it may join together mutually through direct or a substituent, and adjoining X11, and X12, X12 and X13 may form the condensed ring. Z11 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L15 and L16. L15 and L16 express a methine group respectively.
[0022] X14, X15, and R13 express a hydrogen atom or a substituent independently respectively among a general formula (IX), it may join together mutually through direct or a substituent, and X14 and X15 may form the condensed ring. Z12 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L17 and L18. L17 and L18 express a methine group respectively.
[0023] X16, X17, and R14 express a hydrogen atom or a substituent independently respectively among a general formula (X), and Z13 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L19 and L20. L19 and L20 express a methine group respectively.
[0024] 5. Organic electroluminescent element characterized by thing of compound of this organic compound thin film further expressed with following general formula (XI) for which kind is contained at least at least between anode plates and cathode which counter mutually in organic electroluminescent element which pinches luminous layer which has monolayer or organic compound thin film of two or more layers.
[0025]
[Formula 14]

一般式(XI)

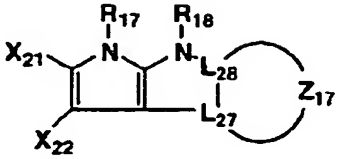


[0026] X18, X19, X20, and R15 express a hydrogen atom or a substituent independently respectively among a formula, and Z14 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L21 and L22. L21 and L22 express a methine group respectively.
[0027] 6. Organic electroluminescent element characterized by thing of compound of this organic compound thin film further expressed with following general formula (XII) for which kind is contained at least at least between anode plates and cathode which counter mutually in organic electroluminescent element which pinches luminous layer which has monolayer or organic compound thin film of two or more layers.
[0028]
[Formula 15]
一般式(XII)

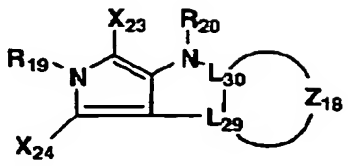


[0029] Z15 expresses a nonmetal atom group required to form the aromatic series heterocycle of 5 or 6 membered-rings with L23 and L24 among a formula, and Z16 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L25 and L26. L23, L24, L25, and L26 express a methine group respectively. R16 expresses a hydrogen atom or a substituent.
[0030] 7. Organic electroluminescent element characterized by thing of compound of this organic compound thin film further expressed with following general formula (XIII), general formula (XIV), general formula (XV), general formula (XVI), or general formula (XVII) for which kind is contained at least at least between anode plates and cathode which counter mutually in organic electroluminescent element which pinches luminous layer which has monolayer or organic compound thin film of two or more layers.
[0031]
[Formula 16]

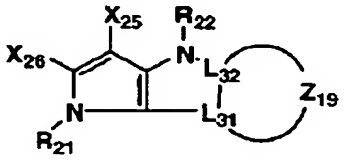
一般式(XIII)



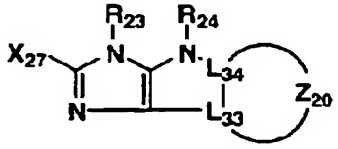
一般式(XIV)



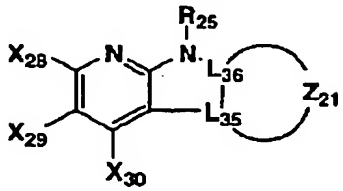
一般式(XV)



一般式(XVI)

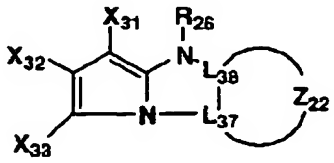


一般式(XVII)

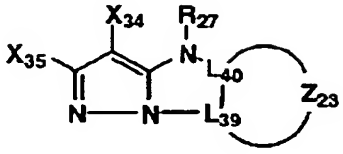


[0032] X21, X22, R17, and R18 express a hydrogen atom or a substituent independently respectively among a general formula (XIII), and it may join together mutually through direct or a substituent, and adjoining X21 and X22 may form the condensed ring. Z17 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L27 and L28. L27 and L28 express a methine group respectively.
[0033] X23, X24, R19, and R20 express a hydrogen atom or a substituent independently respectively among a general formula (XIV), and Z18 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L29 and L30. L29 and L30 express a methine group respectively.
[0034] X25, X26, R21, and R22 express a hydrogen atom or a substituent independently respectively among a general formula (XV), and it may join together mutually through direct or a substituent, and adjoining X25 and X26 may form the condensed ring. Z19 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L31 and L32. L31 and L32 express a methine group respectively.
[0035] X27, R23, and R24 express a hydrogen atom or a substituent independently respectively among a general formula (XVI), and Z20 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L33 and L34. L33 and L34 express a methine group respectively.
[0036] X28, X29, X30, and R25 express a hydrogen atom or a substituent independently respectively among a general formula (XVII), and it may join together mutually through direct or a substituent, and adjoining X28, and X29, X29 and X30 may form the condensed ring. Z21 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L35 and L36. L35 and L36 express a methine group respectively.
[0037] 8. Organic electroluminescent element characterized by thing of compound of this organic compound thin film further expressed with following general formula (XVIII), general formula (XIX), or general formula (XX) for which kind is contained at least at least between anode plates and cathode which counter mutually in organic electroluminescent element which pinches luminous layer which has monolayer or organic compound thin film of two or more layers.
[0038]
[Formula 17]

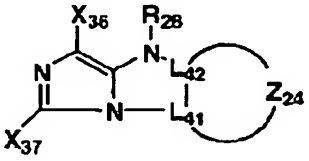
一般式(XVIII)



一般式(XIX)



一般式(XX)



[0039] X31, X32, X33, and R26 express a hydrogen atom or a substituent independently respectively among a general formula (XVIII), and it may join together mutually through direct or a substituent, and adjoining X31, and X32, X32 and X33 may form the condensed ring. Z22 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L37 and L38. L37 and L38 express a methine group respectively.

[0040] X34, X35, and R27 express a hydrogen atom or a substituent independently respectively among a general formula (XIX), and it may join together mutually through direct or a substituent, and adjoining X34 and X35 may form the condensed ring. Z23 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L39 and L40. L39 and L40 express a methine group respectively.

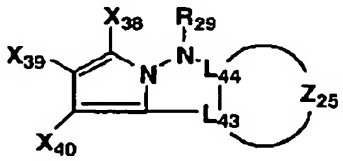
[0041] X36, X37, and R28 express a hydrogen atom or a substituent independently respectively among a general formula (XX), and Z24 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L41 and L42. L41 and L42 express a methine group respectively.

[0042] 9. Organic electroluminescent element characterized by thing of compound of this organic compound thin film further expressed with following general formula (XXI) for which kind is contained at least at least between anode plates and cathode which counter mutually in organic electroluminescent element which pinches luminous layer which has monolayer or organic compound thin film of two or more layers.

[0043]

[Formula 18]

一般式(XXI)



[0044] X38, X39, X40, and R29 express a hydrogen atom or a substituent independently respectively among a formula, and it may join together mutually through direct or a substituent, and adjoining X38, and X39, X39 and X40 may form the condensed ring. Z25 expresses a nonmetal atom group required to form the aromatic hydrocarbon ring or aromatic series heterocycle of 5 or 6 membered-rings with L43 and L44. L43 and L44 express a methine group respectively.

[0045] Hereafter, this invention is explained to a detail. The compound expressed with the general formula (I) of this invention - (XXI) below is explained.

[0046] And (XII) set and Z1 and (Z4, L1, L2) (Z15, L23, L24) aromatic series heterocycle are expressed. said general formula (I) and (II) — For example, a furan, a thiophene, a pyrrole, an imidazole, a pyrazole, 1, 2, 4-triazole, 1 and 2, 3-triazole, oxazole, A thiazole, an isoxazole, an iso thiazole, furazan, a pyridine, Pyrazine, a pyrimidine, pyridazine, indolizine, a quinoline, an iso indole, Indore, an isoquinoline, phthalazine, a pudding, a NAFUCHI lysine, quinoxaline, quinazoline, cinnoline, a pteridine, a carbazole, phenanthridine, an acridine, peri MIJIN, a phenanthroline, phenazine, etc. are expressed. Moreover, these may have two or more substituents of arbitration independently, respectively, and two or more of the substituents condense them mutually, and they may form a ring further.

[0047] Z3, (Z5, L3, L4), in said general formula (I) - (XXI) (Z6, L5, L6), (Z7, L7, L8), (Z8, L9, L10), (Z9, L11, L12), (Z10, L13, L14), (Z11, L15, L16), (Z12, L17, L18), (Z13, L19, L20), (Z14, L21, L22), (Z16, L25, L26), (Z17, L27, L28), (Z18, L29, L30), (Z19, L31, L32), (Z20, L33, L34), (Z21, L35, L36), The aromatic hydrocarbon ring which may have (Z22, L37, L38), (Z23, L39, L40), and (Z24, L41, L42) (Z25, L43, L44) a substituent, or aromatic series heterocycle is expressed. For example, benzene, naphthalene, an anthracene, an azulene, a phenanthrene, Triphenylene, a pyrene, a chrysene, a naphthacene, perylene, pentacene, HEKISASEN, coronene, TORINAFUCHIREN, a furan, a thiophene, a pyrrole, An imidazole, a pyrazole, 1 and 2, 4-triazole, 1 and 2, 3-triazole, Oxazole, a thiazole, an isoxazole, an iso thiazole, furazan, A pyridine, pyrazine, a pyrimidine, pyridazine, indolizine, a quinoline, An iso indole, Indore, an isoquinoline, phthalazine, a pudding, a NAFUCHI lysine, quinoxaline, quinazoline, cinnoline, a pteridine, a carbazole, phenanthridine, an acridine, peri MIJIN, a phenanthroline, phenazine, etc. are expressed. Moreover, these may have two or more substituents of arbitration independently, respectively, and two or more of the substituents condense them mutually, and they may form a ring further.

[0048] Although R1-R29 express a hydrogen atom or a substituent respectively independently as the substituent expressed with R1-R29 — an alkyl group (for example, a methyl group —) An ethyl group, an isopropyl group, a hydroxyethyl radical, a methoxymethyl radical, cycloalkyl radicals (for example, a cyclopentylic group —), such as a trifluoromethyl radical and t-butyl Aralkyl radicals (for example, benzyl, 2-phenethyl radical, etc.), such as a cyclohexyl radical, Aryl groups (for example, a phenyl group, a naphthyl group, p-tolyl group, p-chlorophenyl radical, etc.), an alkoxy group, aryloxy groups (for example, a methoxy group, an ethoxy radical, an isopropoxy group, a butoxy radical, etc.) (for example, phenoxy group etc.), etc. are mentioned. These radicals may be permuted further and a halogen atom, a hydrogen atom, a trifluoromethyl radical, a cyano group, a nitro group, an alkyl group, an aryl group, an alkoxy group, an aryloxy group, an alkylthio group, a dialkylamino radical, a dibenzylamino radical, the diaryl amino group, etc. are mentioned as said substituent.

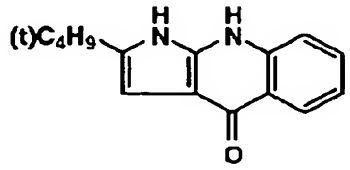
[0049] Although X1-X40 express a hydrogen atom or a substituent respectively independently, as a substituent expressed with X1-X40, the thing of the substituent and homonymy which are expressed with said R1-R29 is mentioned.

[0050] Although the example of a compound expressed with the general formula (I) of this invention - (XXI) below is shown, this invention is not limited to these.

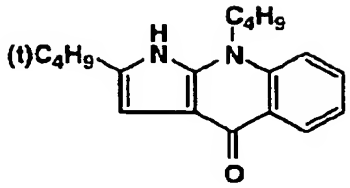
[0051]

[Formula 19]

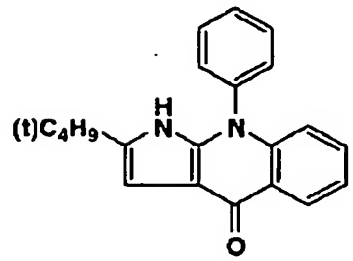
III－1



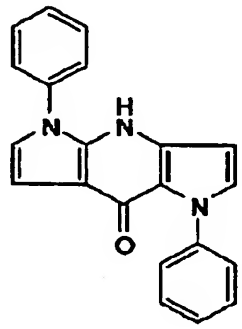
III－2



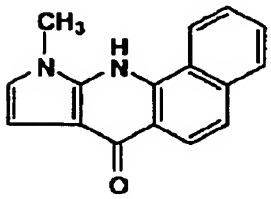
III－3



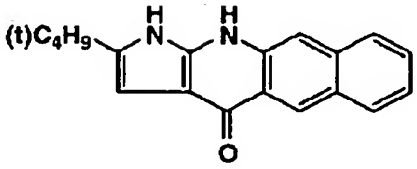
III－4



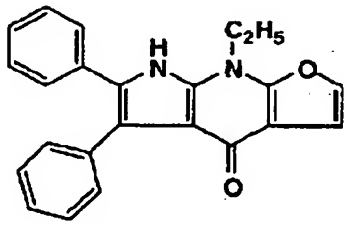
III－5



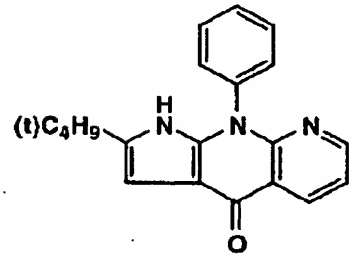
[0052]
[Formula 20]
III－6



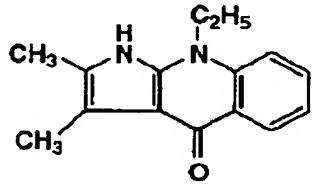
III－7



III－8

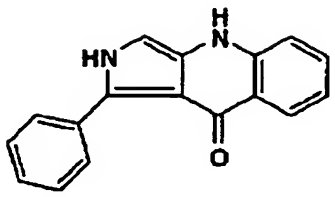


III－9

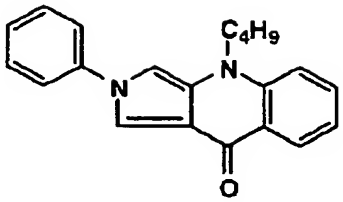


[0053]
[Formula 21]

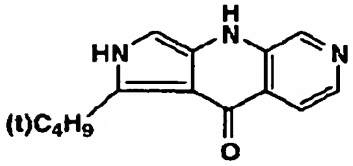
IV－1



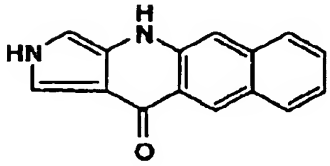
IV－2



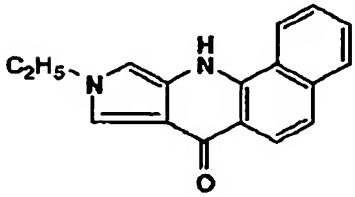
IV－3



IV－4

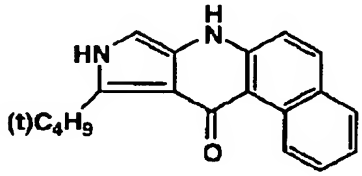


IV－5

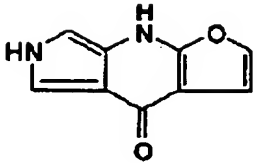


[0054]
[Formula 22]

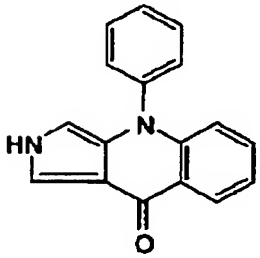
IV－6



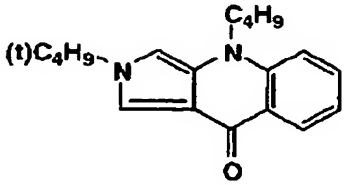
IV－7



IV－8

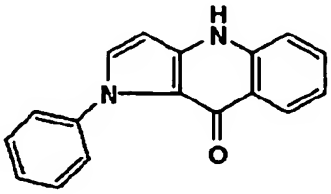


IV－9

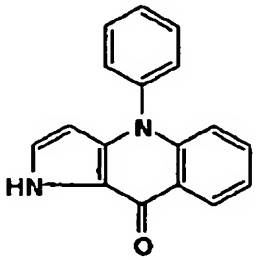


[0055]
[Formula 23]

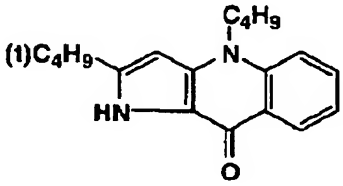
V－1



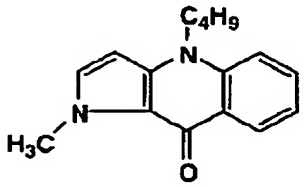
V－2



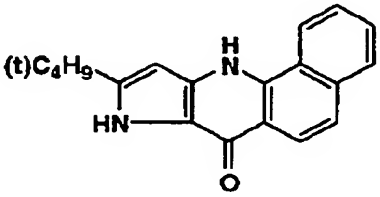
V－3



V－4

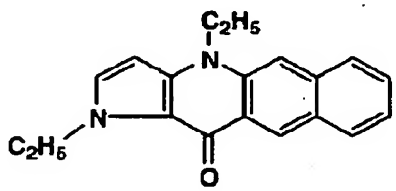


V－5

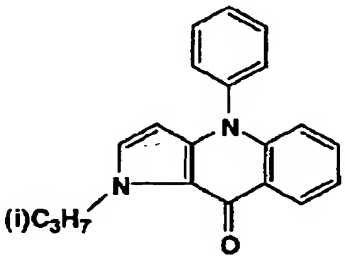


[0056]
[Formula 24]

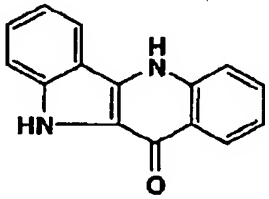
V－6



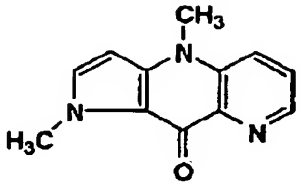
V－7



V－8

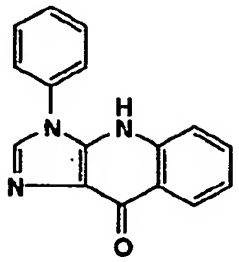


V－9

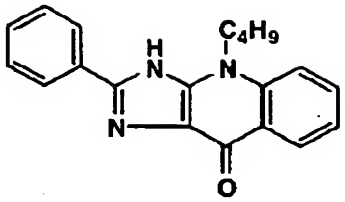


[0057]
[Formula 25]

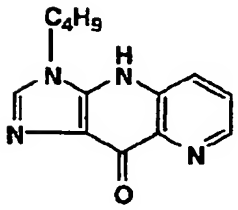
VI－1



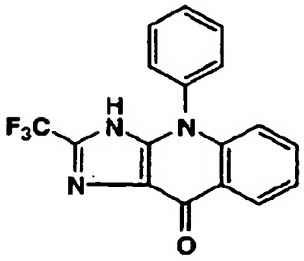
VI－2



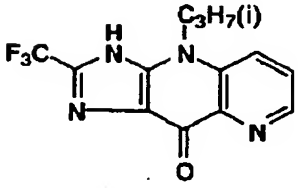
VI－3



VI－4

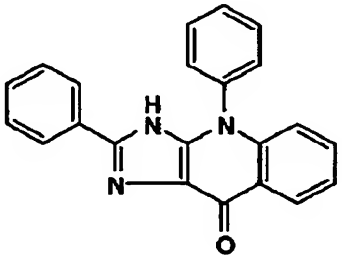


VI－5

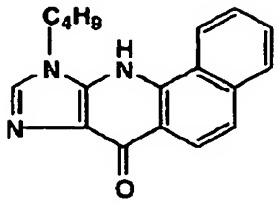


[0058]
[Formula 26]

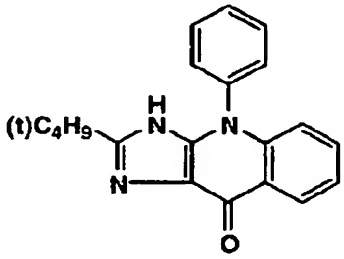
VI－6



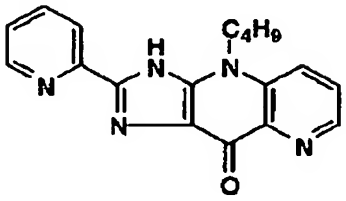
VI－7



VI－8

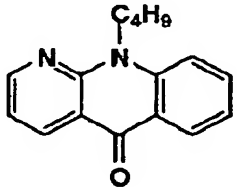


VI－9

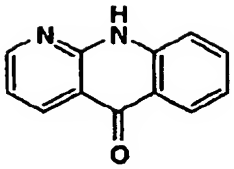


[0059]
[Formula 27]

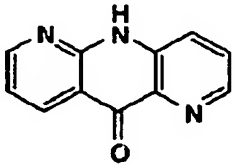
VII－1



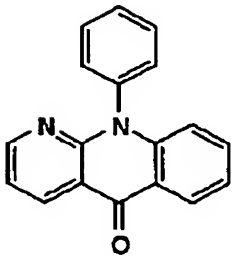
VII－2



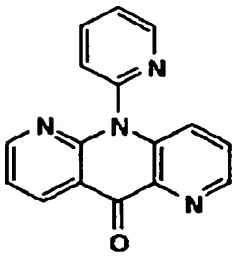
VII－3



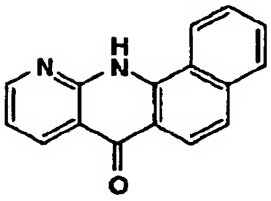
VII－4



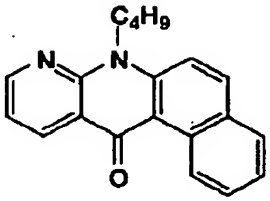
VII－5



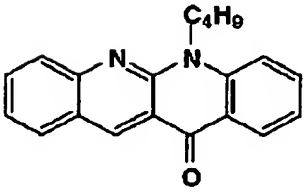
[0060]
[Formula 28]
VII－6



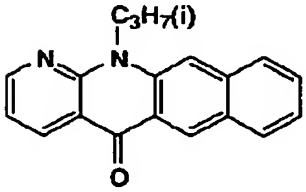
VII－7



VII－8

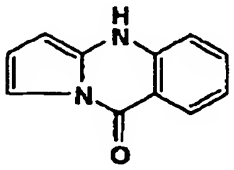


VII－9

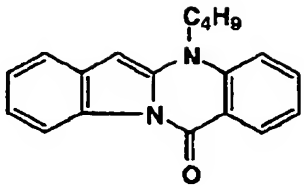


[0061]
[Formula 29]

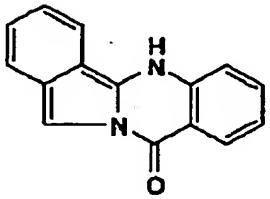
VIII－1



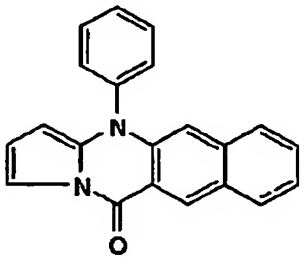
VIII－2



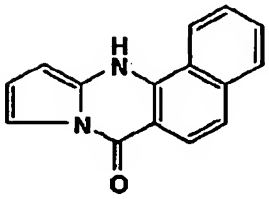
VIII－3



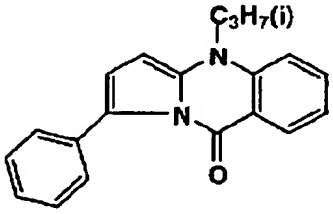
VIII－4



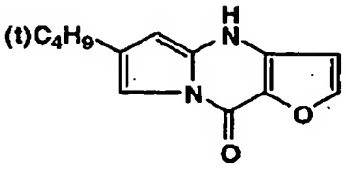
VIII－5



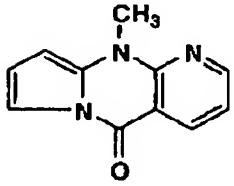
[0062]
[Formula 30]
VIII－6



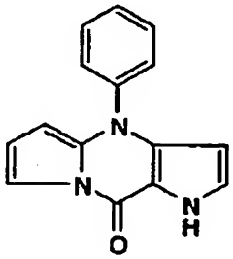
VIII－7



VIII－8



VIII－9



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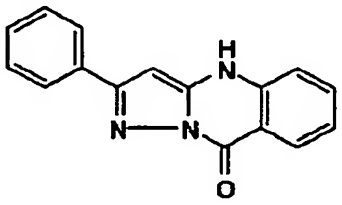
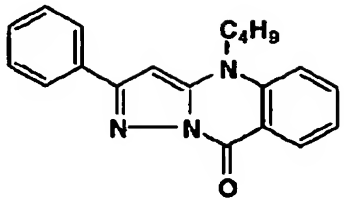
[Formula 31]

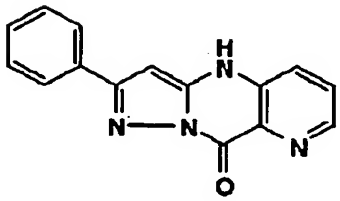
IX－1



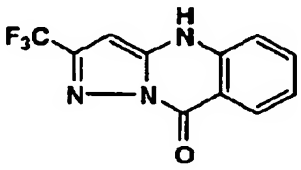
IX－2



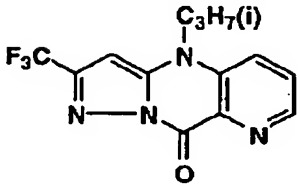
IX－3



IX－4

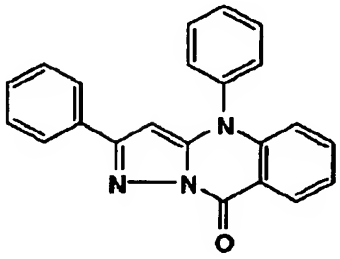


IX－5

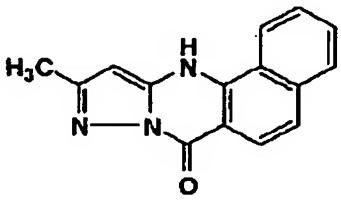


[0064]
[Formula 32]

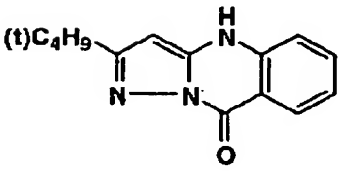
IX－6



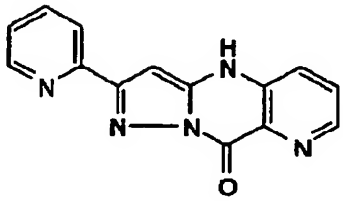
IX－7



IX－8

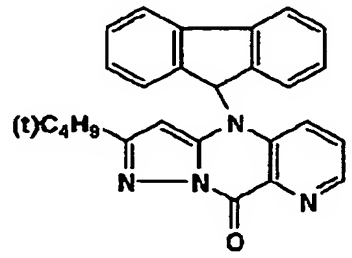


IX－9

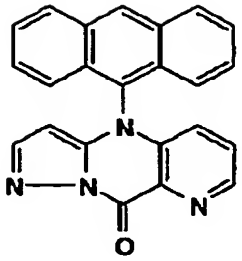


[0065]
[Formula 33]

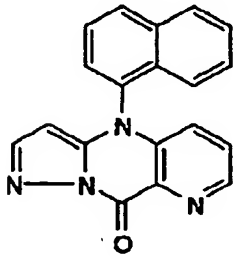
IX－10



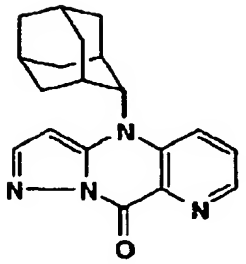
IX－11



IX－12

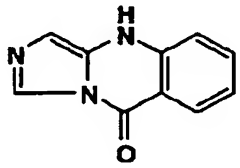


IX－13

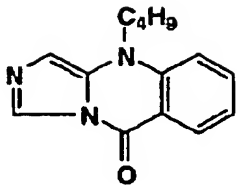


[0066]
[Formula 34]

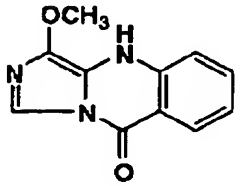
X－1



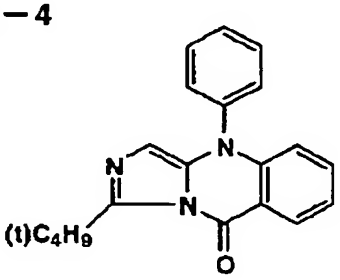
X－2



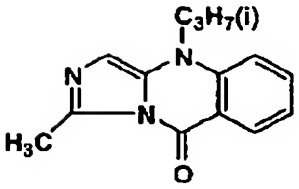
X－3



X－4

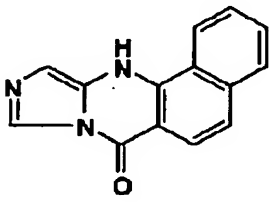


X－5

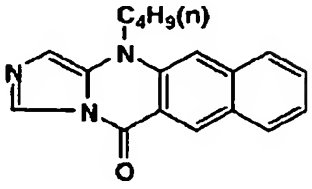


[0067]
[Formula 35]

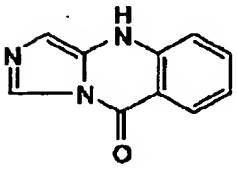
X－6



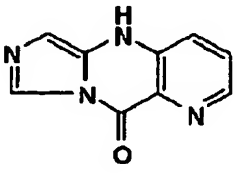
X－7



X－8

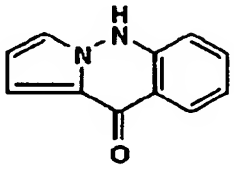


X－9

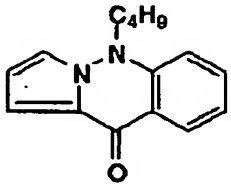


[0068]
[Formula 36]

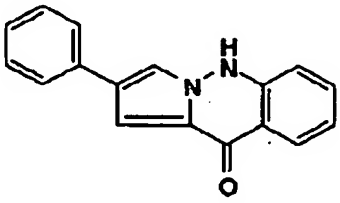
XI－1



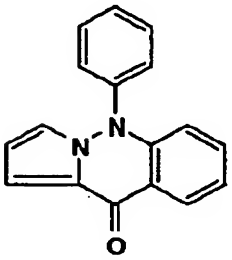
XI－2



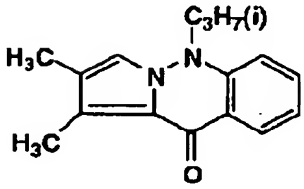
XI－3



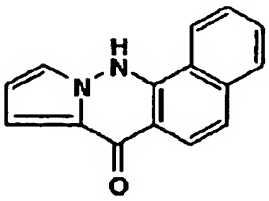
XI－4



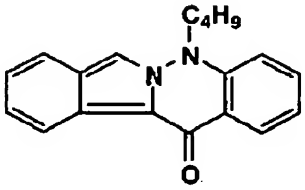
XI－5



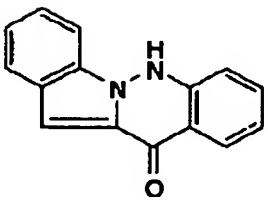
[0069]
[Formula 37]
XI－6



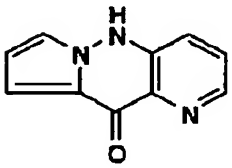
XI－7



XI－8

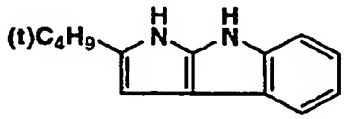


XI－9

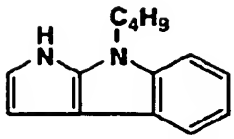


[0070]
[Formula 38]

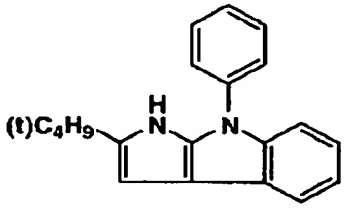
XIII－1



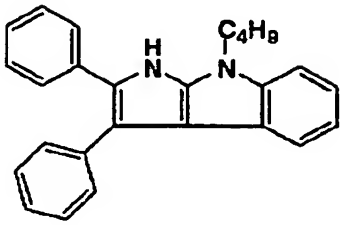
XIII－2



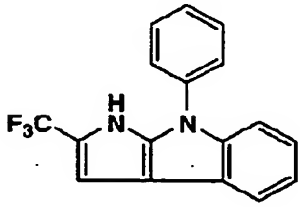
XIII－3



XIII－4

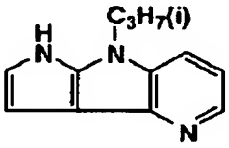


XIII－5

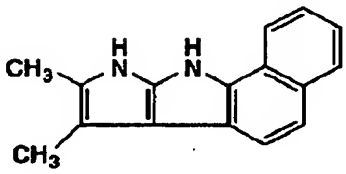


[0071]
[Formula 39]

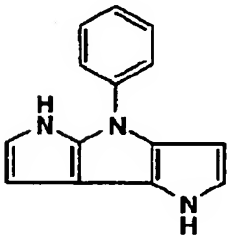
XIII－6



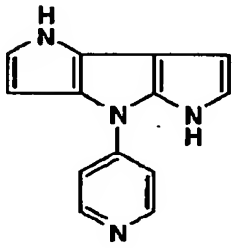
XIII－7



XIII－8

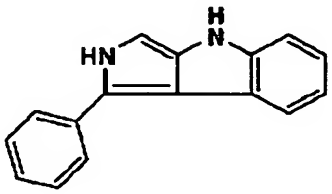


XIII－9

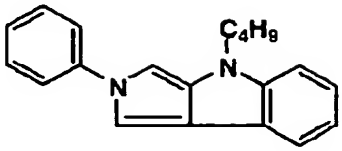


[0072]
[Formula 40]

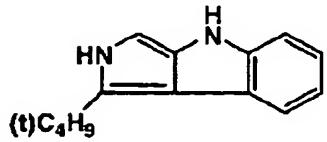
XIV－1



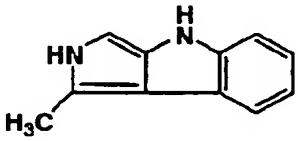
XIV－2



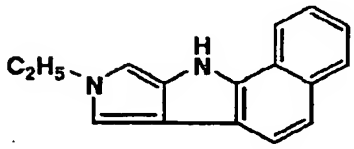
XIV－3



XIV－4

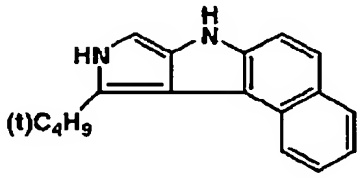


XIV－5

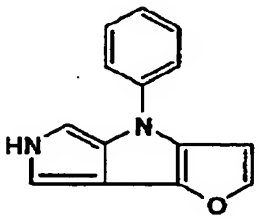


[0073]
[Formula 41]

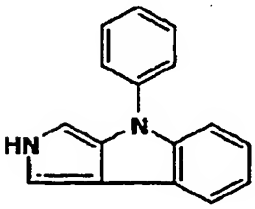
XIV－6



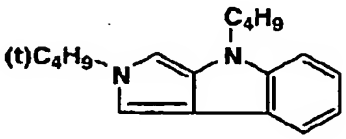
XIV－7



XIV－8

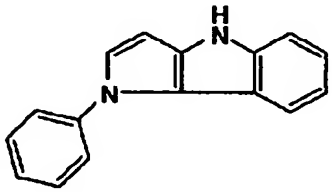


XIV－9

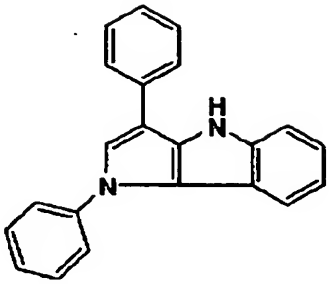


[0074]
[Formula 42]

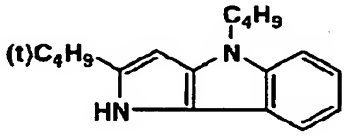
XV－1



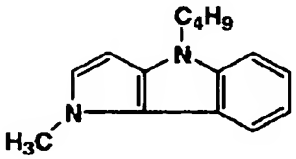
XV－2



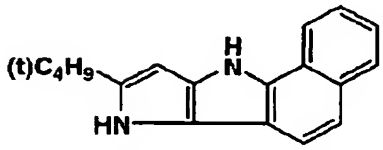
XV－3



XV－4

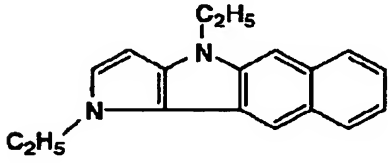


XV－5

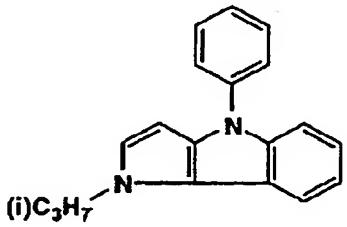


[0075]
[Formula 43]

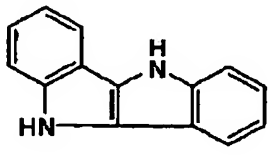
XV－6



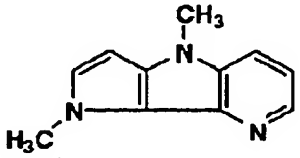
XV－7



XV－8

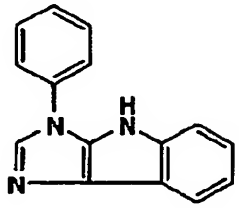


XV－9

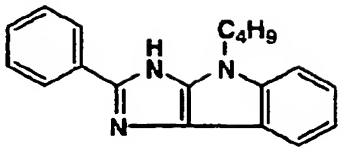


[0076]
[Formula 44]

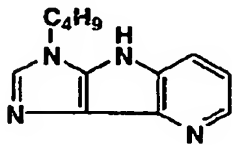
XVI－1



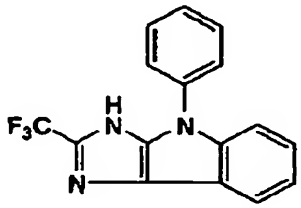
XVI－2



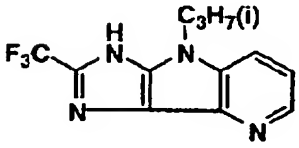
XVI－3



XVI－4

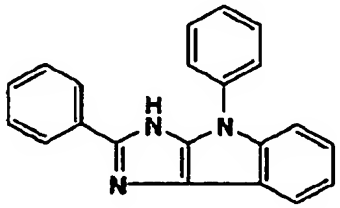


XVI－5

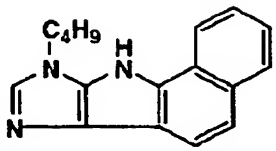


[0077]
[Formula 45]

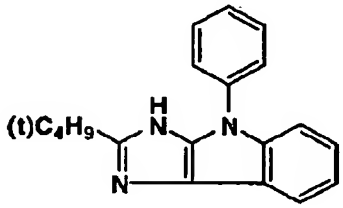
XVI－6



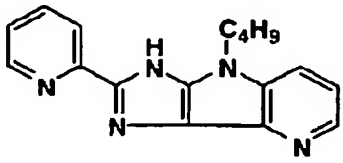
XVI－7



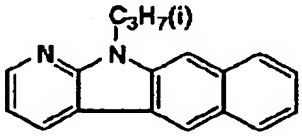
XVI－8



XVI－9

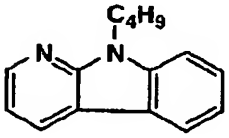


XVI－10

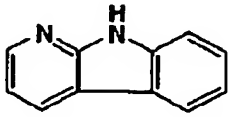


[0078]
[Formula 46]

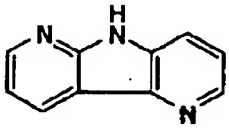
XVII－1



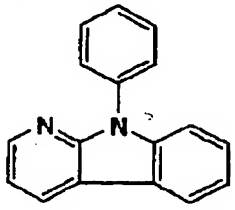
XVII－2



XVII－3

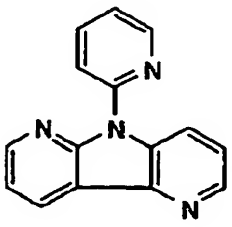


XVII－4

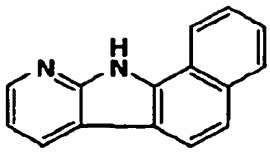


[0079]
[Formula 47]

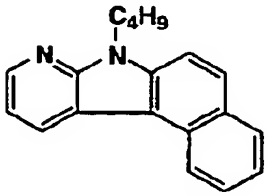
XVII－5



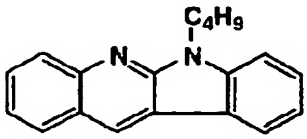
XVII－6



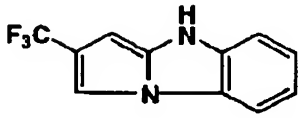
XVII－7



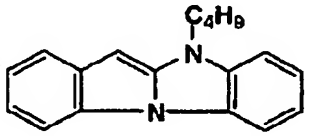
XVII－8



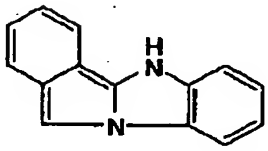
[0080]
[Formula 48]
XVIII－1



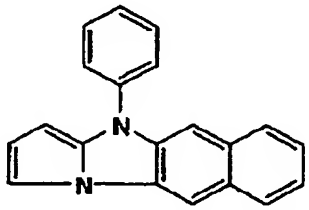
XVIII－2



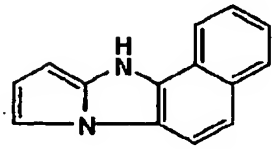
XVIII－3



XVIII－4

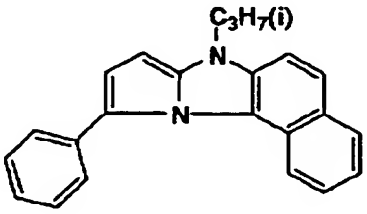


XVIII－5

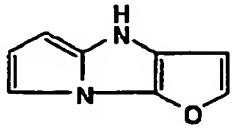


[0081]
[Formula 49]

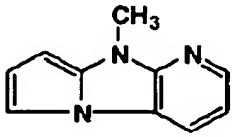
XVIII－6



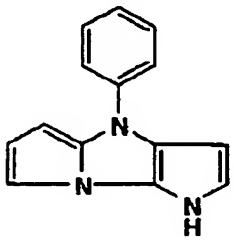
XVIII－7



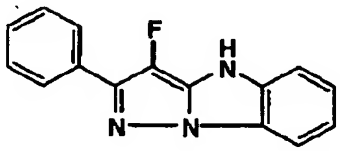
XVIII－8



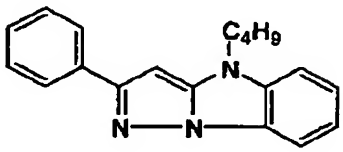
XVIII－9



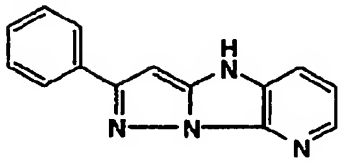
[0082]
[Formula 50]
XIX－1



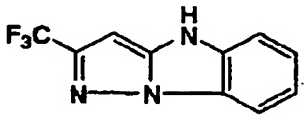
XIX－2



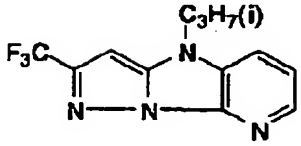
XIX－3



XIX－4

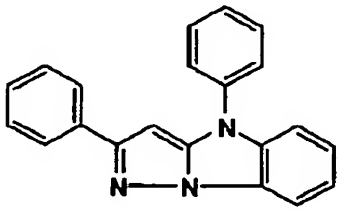


XIX－5

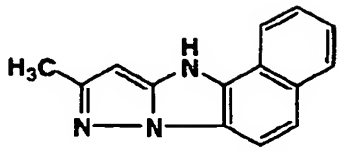


[0083]
[Formula 51]

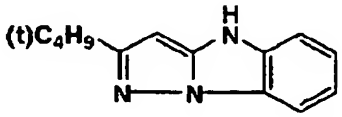
XIX－6



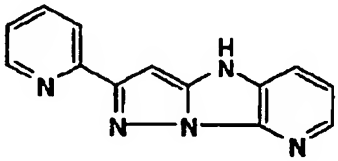
XIX－7



XIX－8

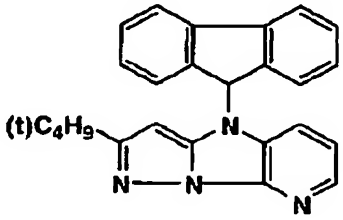


XIX－9

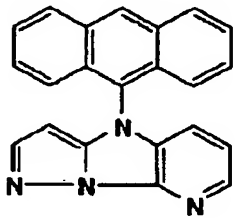


[0084]
[Formula 52]

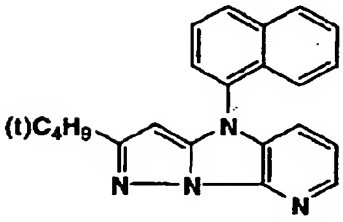
XIX－10



XIX－11

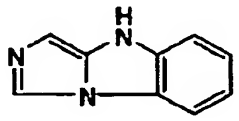


XIX－12

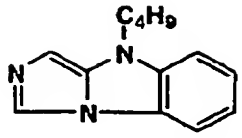


[0085]
[Formula 53]

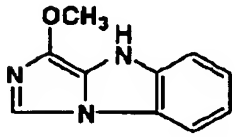
XX－1



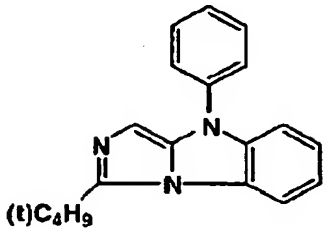
XX－2



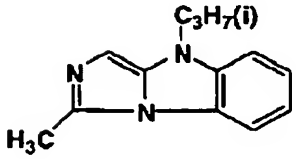
XX－3



XX－4

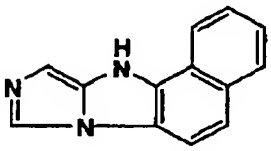


XX－5

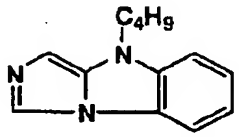


[0086]
[Formula 54]

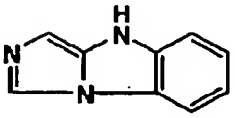
XX－6



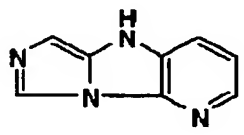
XX－7



XX－8

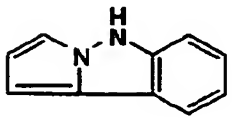


XX－9

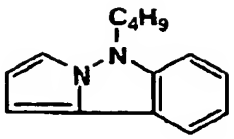


[0087]
[Formula 55]

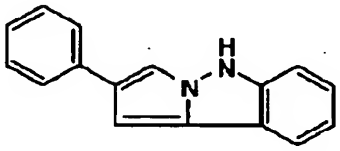
XXI－1



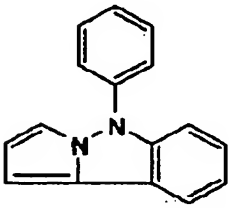
XXI－2



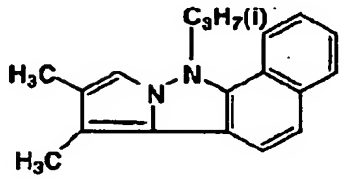
XXI－3



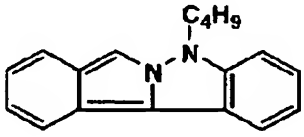
XXI－4



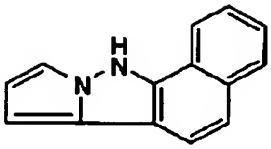
XXI－5



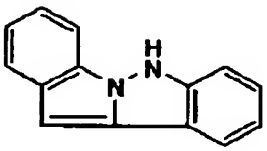
[0088]
[Formula 56]
XXI－6



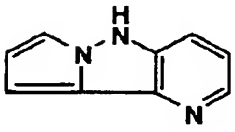
XXI－7



XXI－8



XXI－9

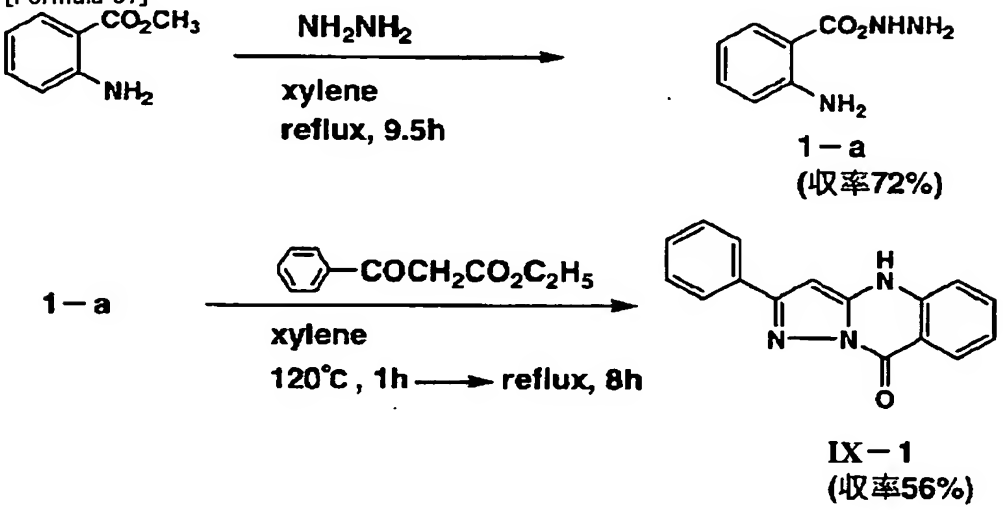


[0089] The synthetic example of the instantiation compound of a compound expressed with the general formula (I)

of this invention - (XXI) below is shown.

1. Synthetic Composition Path of Compound IX-1 [0090]

[Formula 57]

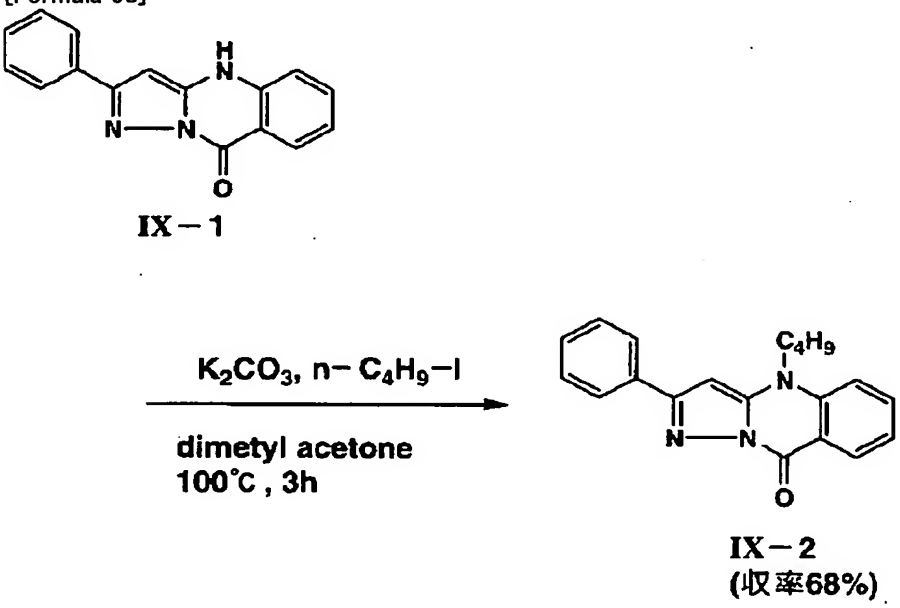


[0091] Anthranilic-acid methyl ester 90.6g was made to react under heating reflux with water hydrazine 54ml among a xylene for 9.5 hours. Reduced pressure distilling off of the solvent was carried out after that, a small amount of ethanol was added, and the rough crystal was obtained. When it furthermore recrystallized in ethanol, intermediate-field 1-a was obtained by 64.9g (72% of yield).

[0092] Next, 15.0g intermediate-product 1-a and 21.0g ethyl benzoyl acetate were made to react for 1 hour, and were made to react under reflux further after that at 120 degrees C among a xylene for 8 hours. Under the present circumstances, the water and ethanol to generate were distilled off. The crystal which deposited after radiationnal cooling was separated. 14.7g (IX-1) (56% of yield) of compounds was obtained by furthermore recrystallizing this crystal with the mixed solvent of N,N-dimethylformamide and a methanol. With NMR and a mass spectrum, it checked that it was the purpose compound (IX-1).

2. Synthetic Composition Path of Compound IX-2 [0093]

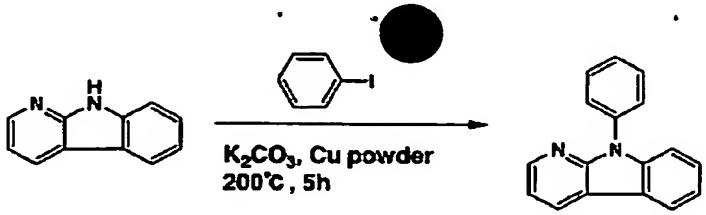
[Formula 58]



[0094] 1.18g (IX-1) of compounds was made to react at 100 degrees C with 1.33g [of potassium carbonate], and iodation n-butyl 1.00g among a dimethyl acetone for 3 hours. The **** opium poppy and 1-N hydrochloric acid neutralized after that. By separating a product and recrystallizing in an acetonitrile, 0.97g (IX-2) (68%) of compounds was obtained. With NMR and a mass spectrum, it checked that it was the purpose compound (IX-2).

3. Composition of Compound XVII-4 [0095]

[Formula 59]



XVII－4
(収率59%)

[0096] Compound XVII-4 are Reference Carmen. Avendano.et It compounded by the approach of a publication to al., J.Chem.Soc.Perkin.Trans.2, Vol8, and (1993) P1547-1555.
[0097] In this invention, fundamentally, an organic EL device pinches a luminous layer between the electrodes of a pair, and has the structure where the hole-injection layer and the electron injection layer were made to intervene if needed. Specifically, there is structure of (i) anode plate / luminous layer / cathode (ii) anode plate / hole-injection layer / luminous layer / cathode (iii) anode plate / luminous layer / electron injection layer / cathode (iv) anode plate / hole-injection layer / luminous layer / electron injection layer / cathode.
[0098] The above-mentioned luminous layer provides the interior of a luminous layer with the place of the recombination of the impregnation function to in_which an electron hole can be poured in by the anode plate or the hole-injection layer at the time of (1) electric-field impression, and an electron can be poured into it from cathode or an electron injection layer, the transportation function, to which the charge (an electron and electron hole) which carried out (2) impregnation is moved by the force of electric field, (3) electrons, and an electron hole, and has the luminescence function tie this to luminescence etc. However, although size may be in the transportation function in which an electron hole is poured in, easy and an electron are poured in, and a difference may be in easy, and it is expressed with the mobility of an electron hole and an electron, what has the function to which one of charges are moved at least is desirable. About the class of luminescent material used for this luminous layer, there is especially no limit and a thing conventionally well-known as a luminescent material in an organic EL device can be used. Such a luminescent material is mainly an organic compound, and the compound of a publication is mentioned [26-page] by the desired color tone for example, from Macromol.Symp. 125-volume 17 pages.
[0099] as the approach of forming a luminous layer using the above-mentioned ingredient — vacuum deposition, a spin coat method, the cast method, and LB — although it can form by thin-film-izing by well-known approaches, such as law, it is desirable that it is especially the molecule deposition film. Here, molecule deposition film is the thin film which deposition was carried out and was formed from the gaseous-phase condition of the above-mentioned compound, and film solidified and formed from the melting condition or liquid phase condition of this compound. usually, this molecule deposition film — LB — it is distinguishable with the thin film (molecule built up film) formed of law, and the difference of condensation structure and higher order structure and the functional difference resulting from it.
[0100] Moreover, after this luminous layer melts the above-mentioned luminescent material to a solvent and considers as a solution with binding material, such as resin, as indicated by JP,57-51781,A, it can thin-film-ize this with a spin coat method etc., and can form it. Thus, although there is especially no limit about the thickness of the formed luminous layer and it can choose suitably according to a situation, it is usually the range of 5nm - 5 micrometers. What uses the large (4eV or more) metal, the alloy, the electrical conductivity compounds, and such mixture of a work function as electrode material as an anode plate in this EL element is used preferably. As an example of such electrode material, conductive transparent materials, such as metals, such as Au, CuI, indiumtinoxide (ITO), and SnO2, ZnO, are mentioned. The above-mentioned anode plate may form a pattern through the mask of a desired configuration at the time of vacuum evaporationo and sputtering of (100-micrometer or more extent) and the above-mentioned electrode material, when a thin film may be made to form such electrode material by approaches, such as vacuum evaporationo and sputtering, and the pattern of a desired configuration may be formed by the photolithography method or it seldom needs pattern precision. When taking out luminescence from this anode plate, it is desirable to make permeability larger than 10%, and below hundreds of ohms / ** of the sheet resistance as an anode plate are desirable. Although thickness is furthermore based also on an ingredient, 10nm - 1 micrometer is usually preferably chosen in 10-200nm.
[0101] What, on the other hand, uses the small (4eV or less) metal (an electron injection nature metal is called), the alloy, the electrical conductivity compounds, and such mixture of a work function as electrode material as cathode is used. As an example of such electrode material, a sodium and sodium-potassium alloy, magnesium, a lithium, magnesium / copper mixture, magnesium / silver mixture, magnesium / aluminum mixture, magnesium / indium mixture, aluminum / aluminum oxide (aluminum 2O3) mixture, an indium, a lithium / aluminum mixture, a rare earth metal, etc. are mentioned. In these, the mixture of the point of endurance over electron injection nature, oxidation, etc. to an electron injection nature metal and the second metal which is a metal with it, for example, magnesium / silver mixture, magnesium / aluminum mixture, magnesium / indium mixture, aluminum / aluminum oxide (aluminum 2O3) mixture, a lithium / aluminum mixture, etc. are suitable. [the large value of a work function and] [more stable than this] The above-mentioned cathode can produce such electrode material by making a thin film form by approaches, such as vacuum evaporationo and sputtering. Moreover, below hundreds of ohms / ** of the sheet resistance as cathode are desirable, and 10nm - 1 micrometer of thickness is usually preferably chosen in 50-200nm. In addition, in order to make luminescence penetrate, if either the anode plate of an organic EL device or

cathode is transparent or translucent, it improves [luminous efficiency] and is convenient.
[0102] Next, the hole-injection layer prepared if needed By having the function to transmit the electron hole poured in from the anode plate to a luminous layer, and making this hole-injection layer intervene between an anode plate and a luminous layer The electron which many electron holes were poured into the luminous layer by lower electric field, and was moreover poured into the luminous layer from cathode or an electron injection layer is accumulated by the interface in a luminous layer with the obstruction of the electron which exists in the interface of a luminous layer and a hole-injection layer, and turns into a component which was excellent in luminescence engine performance -- luminous efficiency improves. About the ingredient (henceforth a hole-injection ingredient) of this hole-injection layer, if it has the aforementioned desirable property, there is especially no limit, and it can choose and use the thing of arbitration in photoconductive material conventionally out of what is commonly used as a charge impregnation transportation ingredient of an electron hole, or the well-known thing used for the hole-injection layer of an EL element.
[0103] The above-mentioned hole-injection ingredient may have impregnation of an electron hole, or electronic obstruction nature, and may be any of the organic substance and an inorganic substance. as this hole-injection ingredient -- for example, a triazole derivative, an OKISA diazole derivative, an imidazole derivative, the poly aryl alkane derivative, a pyrazoline derivative, a pyrazolone derivative, a phenylenediamine derivative, an arylamine derivative, an amino permutation chalcone derivative, an oxazole derivative, a styryl anthracene derivative, and full - - me -- non, a derivative, a hydrazone derivative, a stilbene derivative, a silazane derivative, an aniline system copolymer and conductive polymer oligomer, especially thiophene oligomer, etc. are mentioned. As a hole-injection ingredient, although the above-mentioned thing can be used, it is desirable to use a porphyrin compound, an aromatic series tertiary-amine compound and a styryl amine compound, especially an aromatic series tertiary-amine compound.
[0104] As an example of representation of the above-mentioned aromatic series tertiary-amine compound and a styryl amine compound N, N, N', and N'-tetra-phenyl -4, 4'-diamino phenyl;N, N'-diphenyl-N, N'-screw (3-methylphenyl)-[1 and 1'-biphenyl]-4, and 4'-diamine (TPD); 2 and 2-screw (4-G p-tolylamino phenyl) propane; 1 and 1-screw Cyclohexane; The N, N, N', and N'-tetra--p-tolyl -4, 4'-diamino biphenyl;1, a 1-screw (4-G p-tolylamino phenyl)-4-phenylcyclohexane; screw (4-G p-tolylamino phenyl) Phenylmethane; (4-dimethylamino-2-methylphenyl) A screw Phenylmethane;N, N'-diphenyl-N, and N'-JI (4-methoxypheny) -4, a 4'-diamino biphenyl; An N, N, N', and N'-tetra-phenyl -4, 4'-diamino diphenyl ether;4, and 4'-screw (4-G p-tolylamino phenyl) Biphenyl; N, N, and N-Tori (Diphenylamino) Amine; 4- (p-tolyl) (G p-tolylamino)-4'-[4-(G p-tolylamino) styryl] stilbene; A 4-N, N-diphenylamino-(2-diphenyl vinyl) benzene;3-methoxy-4'-N, and N-diphenylamino still benzene;N-phenyl carbazole, Furthermore, the thing which has in intramolecular two fused aromatic rings indicated by U.S. Pat. No. 5,061,569, For example, a 4 and 4'-screw [N-(1-naphthyl)-N-phenylamino] biphenyl (NPD), 4 and 4' by which the triphenylamine unit indicated by JP,4-308688,A was connected with 3 starburst molds -- 4" (MTDATA) of - tris [N-(3-methylphenyl)-N-phenylamino] triphenylamines etc. is mentioned.
[0105] Moreover, p mold-Si, p mold - Inorganic compounds, such as SiC, can also be used as a hole-injection ingredient. this hole-injection layer -- the above-mentioned hole-injection ingredient -- for example, a vacuum deposition method, a spin coat method, the cast method, and LB -- it can form by thin-film-izing by well-known approaches, such as law. Although there is especially no limit about the thickness of a hole-injection layer, it is usually 5nm - about 5 micrometers. This hole-injection layer may be 1 layer structure which consists of a kind of the above-mentioned ingredient, or two sorts or more, and may be a laminated structure which consists of two or more layers of the same presentation or a different-species presentation.
[0106] Furthermore, as the ingredient, the thing of arbitration can be chosen and used for the electron injection layer used if needed out of a conventionally well-known compound that what is necessary is just to have the function to transmit the electron poured in from cathode to a luminous layer. As an example of the ingredient (henceforth an electron injection ingredient) used for this electron injection layer, heterocycle tetracarboxylic acid anhydrides, such as a nitration fluorene derivative, a diphenyl quinone derivative, a thiopyran dioxide derivative, and naphthalene perylene, a carbodiimide, a deflection ORENIRIDEN methane derivative, anthra quinodimethan and an anthrone derivative, an OKISA diazole derivative, etc. are mentioned. Moreover, although a series of electron transport nature compounds indicated by JP,59-194393,A were indicated in this official report as an ingredient which forms a luminous layer, examination of this invention persons showed that it could use as an electron injection ingredient. Furthermore, in the above-mentioned OKISA diazole derivative, the thiadiazole derivative which permuted the oxygen atom of an oxadiazole ring by the sulfur atom, and the quinoxaline derivative which has the quinoxaline ring known as an electron withdrawing group can also be used as an electron injection ingredient. Moreover, the metal complex (Alq), for example, tris (eight quinolinol) aluminum, of an eight-quinolinol derivative, Tris (5, 7-dichloro-eight quinolinol) aluminum, tris (5, 7-dibromo-eight quinolinol) aluminum, Tris (2-methyl-eight quinolinol) aluminum, tris (5-methyl-eight quinolinol) aluminum, Metal complexes with which the central metal of these metal complexes replaced In, Mg, Cu, calcium, Sn, Ga, or Pb, such as screw (eight quinolinol) zinc (Znq), can also be used as an electron injection ingredient. In addition, that by which a metal free-lancer, metal phthalocyanines, or those ends are permuted with the alkyl group, the sulfonic group, etc. can also be preferably used as an electron injection ingredient. Moreover, the JISUCHIRIRU pyrazine derivative illustrated as an ingredient of a luminous layer can also be used as an electron injection ingredient, and they are n mold-Si and n mold like a hole-injection layer. - Inorganic semi-conductors, such as SiC, can also be used as an electron injection ingredient.
[0107] this electron injection layer -- the above-mentioned compound -- for example, a vacuum deposition method,

a spin coat method, the cast method, and LB — a film can be produced by the thin film-ized method law etc. is well-known, and it can form. Although especially a limit does not have the thickness as an electron injection layer, it is usually chosen in 5nm - 5 micrometers. This electron injection layer may be 1 layer structure which consists of these electron injection ingredient kinds or two sorts or more, or may be a laminated structure which consists of two or more layers of the same presentation or a different-species presentation.

[0108] Next, the suitable example which produces an organic EL device is explained. If the method of producing an EL element which consists of the aforementioned anode plate / hole-injection layer / luminous layer / electron injection layer / cathode as an example is explained, first, on a suitable substrate, 1 micrometer or less of thin films which consist of desired electrode material, for example, matter for anode plates, will be made to form by approaches, such as vacuum evaporationo and sputtering, so that it may become the thickness of the range of 10-200nm preferably, and an anode plate will be produced. Next, the thin film which consists of an ingredient of the hole-injection layer which is a component ingredient, a luminous layer, and an electron injection layer is made to form on this.

[0109] The anion of a compound and the salt of a metal cation which are expressed with the general formula (I) of this invention - (XXI) may be contained in which layer of a hole-injection layer, an electron hole transportation layer, a luminous layer, an electron injection layer, and an electronic transportation layer, and can form the compound and layer of independent or others.

[0110] As the approach of thin-film-izing, although there are a spin coat method, the cast method, vacuum deposition, etc. like the above, the point of the homogeneous film being easy to be obtained and being hard to generate a pinhole to a vacuum deposition method is desirable. When adopting a vacuum deposition method as thin film-ization, although it changes with crystal structures, meeting structures, etc. which are made into the class of compound to be used, and the purpose of the molecule deposition film, as for the vacuum evaporationo condition, it is desirable to choose suitably whenever [boat stoving temperature] generally in 50-450 degrees C, a 10-6 to ten to 3 Pa degree of vacuum, the evaporation rate of 0.01-50nm/second, the substrate temperature of -50-300 degrees C, and the range of 5nm - 5 micrometers of thickness.

[0111] A desired organic EL device is obtained by making the thin film which consists of matter for cathode on it form by approaches, such as vacuum evaporationo and sputtering, after formation of these layers, so that 1 micrometer or less may become the thickness of the range of 50-200nm preferably, and preparing cathode. Although it is desirable for it to be consistent by one vacuum suction, and to produce from a hole-injection layer to cathode as for production of this organic EL device, it is also possible to make production sequence reverse and to produce it in order of cathode, an electron injection layer, a luminous layer, a hole-injection layer, and an anode plate. Thus, luminescence can be observed, if + is impressed for an anode plate and it impresses about electrical-potential-difference 5-40V for cathode as a polarity of -, in impressing direct current voltage to the obtained organic EL device. Moreover, even if it impresses an electrical potential difference with a reverse polarity, luminescence is not produced at all, without a current flowing. Furthermore, in impressing alternating voltage, only when an anode plate changes + and cathode changes into the condition of -, it emits light. In addition, the wave of the alternating current to impress is arbitrary and good.

[0112]

[Example] Although an example is given and this invention is hereafter explained to a detail, the mode of this invention is not limited to this.

[0113] After performing patterning to the substrate (NA[by the NH techno glass company]- 45) which formed 150nm (indiumtinoxide) of ITO(s) on the glass plate as a production anode plate of the organic EL device for example 1 (1-1) comparison, the transparence support substrate which prepared this ITO transparent electrode was cleaned ultrasonically by isopropyl alcohol, it dried with desiccation nitrogen gas, and UV ozone washing was performed for 5 minutes.

[0114] This transparence support substrate is fixed to the substrate electrode holder of a commercial vacuum evaporation system. On the other hand, N, N'-diphenyl-N, N'-screw (3-methylphenyl) [1 and 1'-biphenyl]-4, and 4'-diamine (TPD) 200mg is put into the resistance heating boat made from molybdenum. 200mg of comparison compounds Q -1 was put into another resistance heating boat made from molybdenum, 200mg (Alq3) of tris(8-hydroxyquinolinate)aluminium was put into still more nearly another resistance heating boat made from molybdenum, and it attached in the vacuum evaporation system. Subsequently, after decompressing a vacuum tub up to 4x10 to 4 Pa, it energized on said heating boat containing TPD, heated to 220 degrees C, and vapor-deposited to the transparence support substrate by the evaporation rate 0.1 - 0.3 nm/sec, and the hole-injection layer of 60nm of thickness was prepared. Furthermore, it energized on said heating boat containing a compound Q -1, heated to 220 degrees C, it vapor-deposited on said hole-injection layer by the evaporation rate 0.1 - 0.3 nm/sec, and the luminous layer of 40nm of thickness was prepared. In addition, the substrate temperature at the time of vacuum evaporationo was a room temperature. Furthermore, it energized on said heating boat containing Alq3, heated to 250 degrees C, it vapor-deposited on said luminous layer by evaporation rate 0.1 nm/sec, and the electron injection layer of 20nm of thickness was prepared. In addition, the substrate temperature at the time of vacuum evaporationo was a room temperature.

[0115] Next, open a vacuum tub and the rectangle hole vacancy mask made from stainless steel is installed on an electron injection layer. On the other hand, put magnesium 3g into the resistance heating boat made from molybdenum, and 0.5g of silver is put into the basket for vacuum evaporationo made from a tungsten. After decompressing a vacuum tub up to 2x10 to 4 Pa again, energize on the boat containing magnesium and magnesium

is vapor-deposited by the evaporation rate 1.5 - 2.0 nm/sec. Under the present circumstances, organic EL device OLED-1 for a comparison was produced by heating a silver basket to coincidence, vapor-depositing silver by evaporation rate 0.1 nm/sec, and considering as the counterelectrode which consists of mixture of said magnesium and silver.

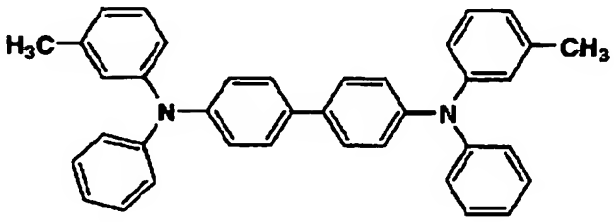
[0116] Furthermore in the above, organic EL device OLED-2 for a comparison were produced by the completely same approach except having transposed the compound Q -1 to the compound Q -2.

[0117] The structure of TPD used above, Alq3, a compound Q -1, and a compound Q -2 is shown below.

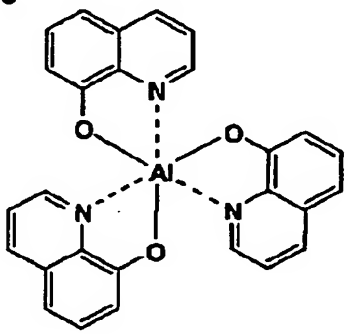
[0118]

[Formula 60]

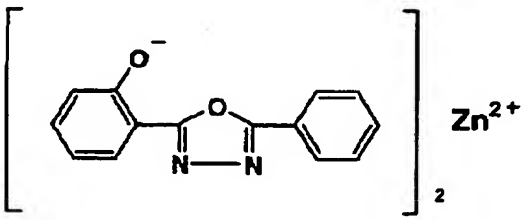
TPD



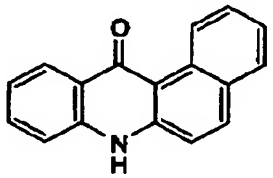
Alq3



化合物Q－1



化合物Q－2



[0119] (1-2) In production of organic EL device OLED-1 for the comparison by the production above (1-1) of the organic EL device of this invention, organic EL device OLED-3-OLED-36 of this invention were produced by the completely same approach as organic EL device OLED-1 except transposing a compound Q -1 to the compound of this invention shown in Table 1 and Table 2.

[0120] 10 volts of direct currents were impressed to organic EL device OLED-1 for organic EL device OLED-3-OLED-36 and a comparison of this invention, and OLED-2 by having used as cathode the counterelectrode which consists the ITO electrode of a component of an anode plate, magnesium, and silver, and measurement evaluation of the luminescence brightness was carried out. The value (relative value) of the ratio of the highest luminescence brightness of each organic EL device sample when setting the comparative highest luminescence brightness of organic EL device OLED-1 to 1.0 is shown in Table 1 and Table 2.

[0121] The above progress and a result are shown in Table 1 and Table 2.

[0122]

[Table 1]

有機 EL 素子 試料 No.	発光層の化合物	最高到達輝度	備考
OLED-1	Q-1	1.0	比較
OLED-2	Q-2	1.2	比較
OLED-3	III-2	14	本発明
OLED-4	III-8	15	本発明
OLED-5	IV-2	17	本発明
OLED-6	IV-9	17	本発明
OLED-7	V-6	15	本発明
OLED-8	V-7	16	本発明
OLED-9	VI-2	16	本発明
OLED-10	VI-8	17	本発明
OLED-11	VII-4	18	本発明
OLED-12	VII-8	16	本発明
OLED-13	VIII-2	17	本発明
OLED-14	VIII-8	18	本発明
OLED-15	IX-2	17	本発明
OLED-16	IX-6	18	本発明
OLED-17	IX-10	18	本発明
OLED-18	IX-12	17	本発明
OLED-19	X-4	19	本発明
OLED-20	X-7	17	本発明
OLED-21	XI-4	18	本発明
OLED-22	XI-7	19	本発明

[0123]
[Table 2]

有機 EL 素子 試料 No.	発光層の化合物	最高到達輝度	備考
OLED-23	XIV-2	17	本発明
OLED-24	XIV-9	15	本発明
OLED-25	XV-6	16	本発明
OLED-26	XV-7	17	本発明
OLED-27	XVII-1	17	本発明
OLED-28	XVII-5	18	本発明
OLED-29	XVII-2	17	本発明
OLED-30	XVIII-4	18	本発明
OLED-31	XIX-5	18	本発明
OLED-32	XIX-11	19	本発明
OLED-33	XX-4	18	本発明
OLED-34	XX-7	17	本発明
OLED-35	XXI-4	16	本発明
OLED-36	XXI-5	18	本発明

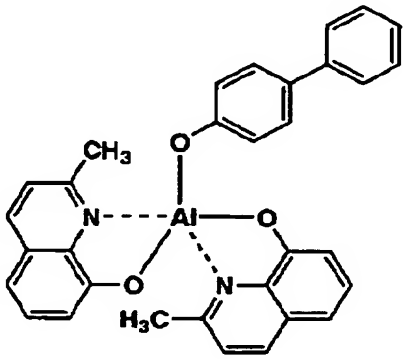
[0124] It is in ** that the organic EL device which used the compound of this invention (considering as a luminous layer) shows luminescence of high brightness so that clearly from Table 1 and Table 2.
[0125] After performing patterning to the substrate (NA[by the NH techno glass company]- 45) which formed 150nm of ITO(s) on the glass plate as a production anode plate of the organic EL device of example 2 (2-1) this invention, the transparence support substrate which prepared this ITO transparent electrode was cleaned ultrasonically by isopropyl alcohol, it dried with desiccation nitrogen gas, and UV ozone washing was performed for 5 minutes.
[0126] After fixing this transparence support substrate to the substrate electrode holder of a commercial vacuum evaporation system and decompressing a vacuum tub up to 4x10 to 4 Pa, TPD was vapor-deposited to the transparence support substrate by the evaporation rate 0.1 - 0.3 nm/sec, and the hole-injection layer of 60nm of thickness was prepared. Furthermore, from a source of vacuum evaporationo which is different in compound III-5 of the screw (2-methyl-8-quinolate) (4-phenyl phenolate) aluminum and this invention of the following structure, vapor codeposition was carried out with the mass ratio 100:1 on said hole-injection layer by the evaporation rate 0.1 - 0.3 nm/sec, and the luminous layer of 40nm of thickness was prepared. Furthermore, said heating boat containing Alq3 was energized, and it heated to 250 degrees C, it vapor-deposited on said luminous layer by evaporation rate 0.1

nm/sec, and the electron injection layer of 20nm of thickness was prepared. In addition, the substrate temperature at the time of vacuum evaporationo was a room temperature. Furthermore on it, organic EL device OLED-37 of this invention were produced from a source of vacuum evaporationo which is different in magnesium and silver by carrying out vapor codeposition with a mass ratio 6:1 by the evaporation rate 1.5 - 2.0 nm/sec, and considering as the counterelectrode which consists of mixture of said magnesium and silver.

[0127]

[Formula 61]

ビス(2ーメチルー8ーキノリノラート)(4ーフェニルフェノラート)アルミニウム



[0128] Furthermore in the above, organic EL device OLED-38-OLED-43 of this invention were produced by the completely same approach except transposing compound III-5 to compound IX-1, IX-4, XVI-3, XVIII-3, XIX-9, and XX-8.

(2-2) In production of this invention in the production above (2-1) of the organic EL device for a comparison of organic EL device OLED-37, without using compound III-5, it vapor-deposited in thickness of 40nm only using screw (2-methyl-8-quinolate) (4-phenyl phenolate) aluminum (Alq3), and organic EL device OLED-44 for a comparison were produced by the completely same approach as OLED-37 except having considered as the luminous layer.

[0129] 10 volts of direct currents were impressed to organic EL device OLED-44 for organic EL device OLED-37-OLED-43 and a comparison of this invention by having used as cathode the counterelectrode which consists the ITO electrode of a component of an anode plate, magnesium, and silver, and measurement evaluation of the luminescence brightness was carried out. The value (relative value) of the ratio of the highest luminescence brightness of each organic EL device sample when setting the comparative highest luminescence brightness of organic EL device OLED-44 to 1.0 is shown in Table 3.

[0130] The above progress and a result are shown in Table 3.

[0131]

[Table 3]

有機 EL 素子試料 No.	共蒸着する化合物	最高到達輝度	備考
OLED-37	III-5	15	本発明
OLED-38	IX-1	17	本発明
OLED-39	IX-4	18	本発明
OLED-40	XVI-3	16	本発明
OLED-41	XVIII-3	17	本発明
OLED-42	XIX-9	18	本発明
OLED-43	XX-8	16	本発明
OLED-44	なし	1.0	比較

[0132] It is in ** that the organic EL device which used the compound of this invention (considering as a doping ingredient) shows luminescence of high brightness so that clearly from Table 3.

[0133] After carrying out the spin coat only of the compound (IV-2, VII-7, VIII-2, IX-10, X-4, XVII-7, XVIII-2, XIX-6, XX-7) of example 3 this invention on ITO, it turned out that the organic EL device sample of the monolayer configuration which vapor-deposited cathode also emits light green from blue on the electrical potential difference of 10-18V.

[0134]

[Effect of the Invention] By this invention, the new organic electroluminescent element ingredient and the organic electroluminescent element which emit light in high brightness can be offered.

[Translation done.]